

3 STATE-WIDE CARBON SEQUESTRATION

A state-wide inventory of existing and potential carbon sinks and greenhouse gas emissions is a useful tool both for establishing a baseline level in which to measure future state-wide carbon sequestration and emission reductions. In addition to preparing an inventory of current carbon levels and greenhouse gas emissions, Idaho may wish to forecast *future* levels of stored carbon and greenhouse gas emissions in the absence of state policies to reduce emissions. Such a forecast could serve as a benchmark against which future activities could be measured. Idaho will also need to establish a current level of sequestration of carbon and predict a potential level to determine its capability of participating in any future programs or markets.

3.1 STATEWIDE CARBON LEVELS

The first step in a state's effort to encourage carbon sequestration and greenhouse gas emission activities is to identify all source categories in the state of those sinks and emissions. Site specific baselines will need to be determined before a landowner could sell carbon credits within a carbon market. The current (or past) level of stored carbon and emission levels establishes a baseline in which future practices will accrue "carbon credits". By developing an inventory, thus establishing a baseline, it can also identify those source categories that contribute the most in offsets or reductions of greenhouse gases. This identification of low soil carbon areas, for instance, would lead the state towards practices or activities that would provide the highest carbon sequestration within that area. Agricultural greenhouse gas emissions, where found to be high, could be similarly addressed.

3.1.1 Current State-wide Carbon Levels

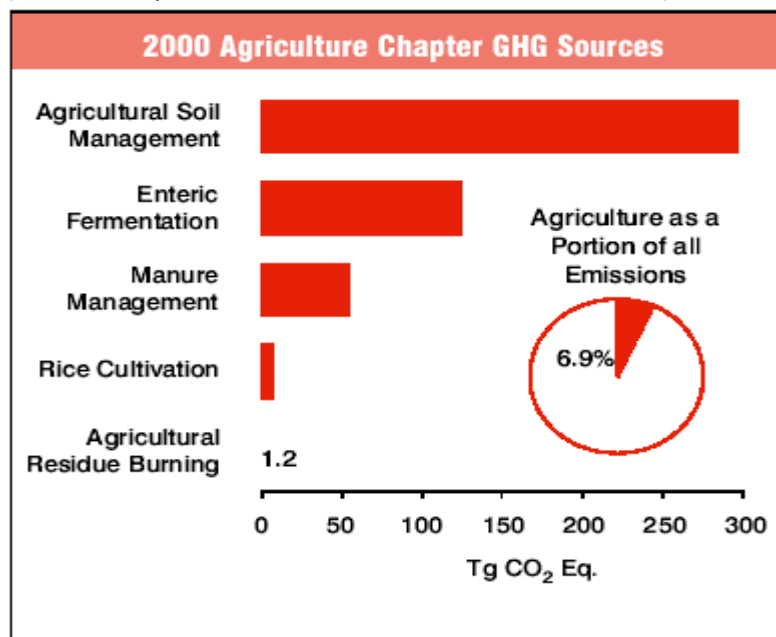
Currently Idaho does not have a good baseline estimate of carbon sinks or a complete greenhouse gas inventory. EPA has provided an estimate of carbon dioxide emissions simply based on fossil fuel use which is estimated at about 3 million metric tons carbon equivalent (MMTCE) for 1990 and 4.1 for 1999. The majority has been estimated to be coming from industrial and transportation sources.

(<http://yosemite.epa.gov/OAR/globalwarming.nsf/content/EmissionsStateEnergyCO2Inventory.es.html>)

Initial U.S. estimates in carbon losses on agricultural croplands ranges from 30 to 50% of its soil organic carbon just in the conversion of native soils to cropland over the last 100 years. With nearly 292 million acres of existing cropland in the U.S., improved management, primarily conversion to direct seed or no till, could sequester near pre-agricultural levels of soil organic carbon (Lal et al. 1998). In Idaho, with about 4.5 million acres of cropland, there could be a significant amount

Figure 1. U.S. Agriculture Greenhouse Gas Sources

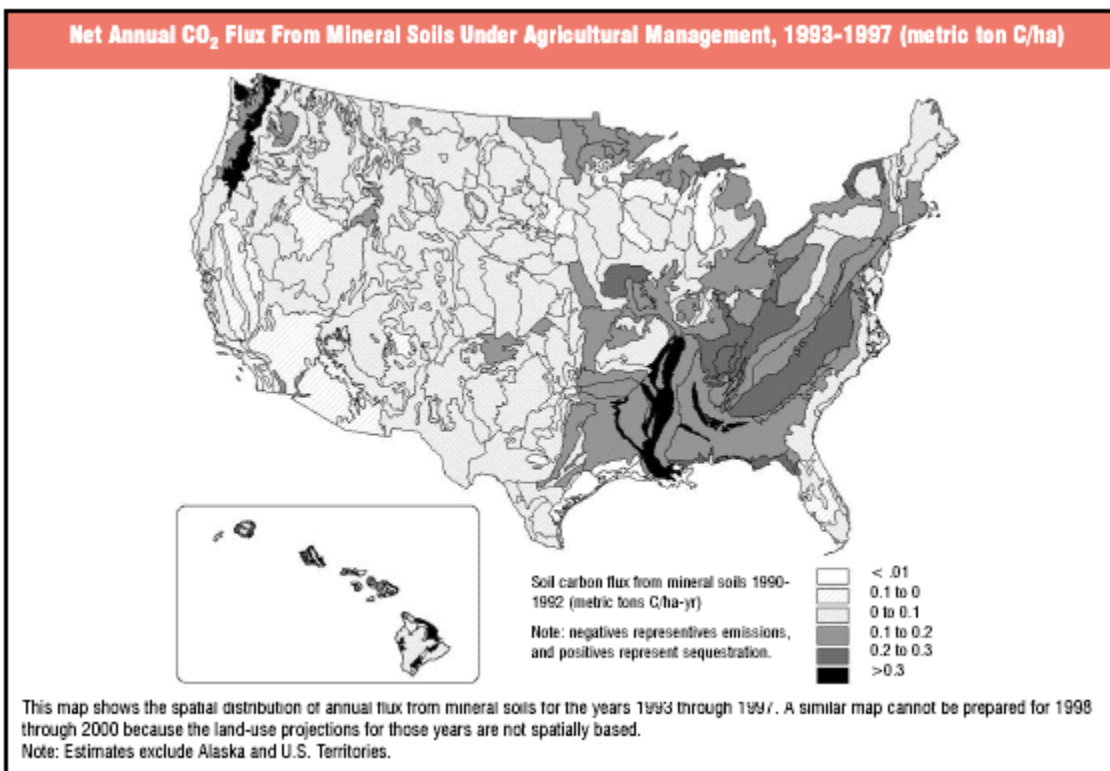
(Source: Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2000)



sequestered in Idaho. Of the 292 million acres in the U.S., Idaho croplands constitute about 2% of the total, thus might only sequester 2% of the total potential on croplands in the U.S.

It has been estimated that in 2000, agricultural activities were responsible for 485 MMT CO₂ Eq., approximately 7% of the total U.S. emissions (EPA, 2002, Figure 1.). The majority of the agricultural emissions are nitrous oxide (65%), primarily from agricultural soils due to fertilization and other practices. Methane emission from enteric fermentation and manure management were near 26% and 8% respectively, primarily from beef and dairy cattle.

Figure 2 – (Source: Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2000)



Carbon flux (sequestration) was estimated for national agricultural soils have also been completed from 1990 through 2000. Mineral soils sequester carbon, whereas organic soils and liming practices emit carbon. Year 2000 carbon flux levels were estimated at 67 MMT CO₂ Eq. and 37 MMT CO₂ Eq. in 1990. The estimated net annual carbon dioxide flux from mineral soils from 1993 to 1997 in Idaho range basically 0 to 0.1 metric tons/hectare, whereas Eastern U.S. and western Washington and Oregon state soil ranged from 0.1 to >0.3 metric tons/hectare (Figure 2). Increased conservation efforts, primarily the adoption of no-till and conversion to perennial pasture and hay land, have caused an increase of sequestration, which then would then decrease the estimated net emissions. Idaho may also see increased sequestration if its upward trend of no-till and other management factors continue. Idaho's pre-irrigated calcareous soils along the Snake

River plain in southern Idaho had lower soil organic matter than what they are today. In contrast, pre-cropland soil carbon levels within high-precipitation areas generally have lower soil carbon levels today. Just looking at these differences between two cropland areas makes it difficult to estimate a state-wide average soil carbon level.

There are approximately 747 million acres of forested lands in the U.S., which has remained fairly constant during the last few decades. The approximate 23 million acres of forest lands in Idaho constitutes 3% of the total. Total U. S. net carbon flux in 2000 was about 903 million metric tons of carbon dioxide (MMT CO_{2e}) (EPA, 2001). Idaho and Montana were combined for the national estimate, constituting about 7.6% of the total U.S. carbon stock. By this estimate, Idaho would have about 2-3% of the total carbon flux in the nation. Simply estimating Idaho forest flux by percentage of its total in the U.S. would estimate Idaho's forests sequestering approximately 27 MMT CO₂ Eq. These estimates include the trees, understory, forest floor, forest soils, logging residues, harvested wood products, and land filled wood. To properly estimate Idaho's forest flux, further analysis and adjustments would likely need to be made in some or all of the categories which can sequester carbon. 1990 estimates were at 1097 MMT CO₂ Eq. for the entire U.S. forests, 33 MMT CO₂ Eq. for Idaho if the same logic is used for the estimate.

Estimating active carbon sequestration rates may be accomplished through a land-based inventory with existing data, where general land management and ownership, and current activities are described. Assigning some general estimates of carbon sequestration rates, which may vary widely depending on land use and practice, can provide a current baseline amount of carbon storage. The baseline year, which seems to be based on international consensus, is 1990. If Idaho continues to establish state-wide carbon sequestration rates, 1990 may likely be the year in which to compare a current sequestration. This would provide an indication of an increase or decrease of the rate of sequestration state-wide. There would be, however, a wide range of sequestration. Policy decisions regarding carbon sequestration and related activities may be best made based on current trends in Idaho. If there is a downward trend in sequestration activities while there are increasing levels of emissions occurring within the state, it may choose to begin strategies to reverse the sequestration trends to begin to bring Idaho into a net reduction or offset of greenhouse gas emissions. If however, sequestration is increasing, then Idaho may choose to further evaluate to see if the trend will continue, and then ensure that a positive trend continues through policies and other strategies.

3.1.2 Forecasting State-wide Carbon Levels

Idaho may project the level of carbon sequestration rates and greenhouse gas emission reductions it will achieve through state-wide carbon markets and programs. That projection will need to refer back to the baseline discussed above to actually show a positive trend.

Projecting future carbon levels and emission reductions relative to a static baseline is less complex once the state greenhouse gas inventory is developed. However, to the extent carbon sequestration rates and greenhouse gas emissions are likely to grow with or without state policies, the use of a static baseline will likely understate future carbon sequestration rates and greenhouse gas emissions. If static data are used to estimate levels, the greenhouse gas reductions may be understated as well. For example, if a state plans to implement a carbon sequestration program that will include a certain percentage of all private forest landowners, and assumes the same number of land owners in 2010 as in 1990, the greenhouse gas reductions due to the program are likely not to be estimated correctly. With a transportation emission reduction strategy, for example, there will likely be more motorists and may skew analysis results if this increase is not accounted for.

An alternative approach is to project emission reductions relative to a forecasted reference case which accounts for projected changes in the state's population, economic activity, and other factors. This approach has the advantage of greater realism and thus greater accuracy. Another advantage is that if Idaho plans to achieve some set carbon sequestration and greenhouse gas emission levels, use of a forecasted reference case would allow the state to project whether its programs, policies and voluntary carbon market participation will achieve a target level.

Another approach would be to forecast carbon sequestration and greenhouse gas emission reductions only for those sectors in which the state plans to implement programs. This modified approach would enable the state to project with relative accuracy the offsets and reductions its program would achieve, in relation to future net carbon sequestration and greenhouse gas emission levels in the absence of programs. However, forecasting carbon sequestration (offsets) and greenhouse gas emissions for only some sectors would not enable the state to estimate total statewide levels in the absence of programs; thus the state would not know the total net greenhouse gas reductions needed to achieve some target level of carbon sequestration and/or greenhouse gas emissions.

Note that uncertainty is a significant concern when forecasting greenhouse gas emissions. To prepare reliable forecasts, Idaho should extend carbon sequestration and greenhouse gas emission forecasts only into the near future. Given the degree of uncertainty already associated with existing methodologies and available data, carrying projections beyond this point can undermine the usefulness of forecasts. The maximum time frame for projecting emissions in most situations is likely to be 15 to 20 years, which is the typical time frame for energy use projections. Beyond that, uncertainties in technological changes alone will likely call into question the accuracy of forecasts.

Forecasting can be complex because there are many factors that can affect future emissions, including population growth, economic growth, technological improvements, and degree of urbanization. Possible means of accounting for these external factors include expert judgment, content analysis, trending methods, economic forecasting, and end-use forecasting methods.

Some of the agricultural independent variables that may be used to estimate a carbon sequestration and greenhouse gas emission calculations are:

- Agriculture and forestland carbon sequestration by specific practices/activities,
- Greenhouse gas emissions from agriculture and forest land management
- Methane emissions from livestock, such as dairy and beef cattle, horses, and sheep,
- Methane emissions from livestock manure,
- Biofuels production and use.

3.1.3 Leakage of Greenhouse Gases During Implementation of Practices/Activities

When predicting carbon sequestration and greenhouse gas emission reductions, forecasts should take into account the possibility of “leakage” of greenhouse gas emissions. An example of such leakage of greenhouse gases is that during the implementation and operation of a practice or activity expected to increase carbon sequestration, there is an increase of greenhouse gases because of additional fossil fuel use through additional transportation and production activities. Another example is with ethanol production. Production related greenhouse emissions would likely need to be accounted for to estimate a net greenhouse gas emission reduction within the transportation sector. Many other examples of potential “leakage” could be identified; the challenge for state carbon sequestration and greenhouse gas planners is to identify areas where potential leakage may be significant, and to adjust their estimates of greenhouse gas reductions accordingly. This also shows that a “whole-farm” analysis is likely needed for a potential seller of carbon credits to encourage the actual sale of those credits.

3.1.4 Additionality

There is uncertainty regarding the acceptability of state or federal mandated practices or activities that are generating carbon credits with a carbon market. Where carbon sequestration practices and related activities are taking place, simply because of regulation or program incentives, those carbon credits produced may not be allowed to be sold or counted as greenhouse gas offsets. The potential expectation

that some practices and activities may not be eligible for greenhouse gas offsets should not, however, dissuade the state from further exploring all potential practices and activities that may increase carbon sequestration and reduce greenhouse gases, regardless how they are implemented. It is not clear at this time if additionality will hinder carbon sequestration activities.

3.1.5 Future Activities

The initial estimate of current and potential levels of carbon sequestration looks positive. Further analysis is needed to determine what the state-wide potential of carbon sequestration might actually be in the near future, with or without carbon sequestration markets and state programs. Some future activities have been identified to better estimate and predict the physical capability of carbon sequestration in Idaho:

- Coordinate state-wide GIS (geographic information system) database development through the state GIS coordinator
- Prepare a state-wide GIS soils database that estimates current soil carbon levels
- Prepare a state-wide forestry based GIS database that estimates current carbon levels
- Improve the state-wide GIS based land use and ownership database
- Prepare a state-wide GIS based land management database
- Identify and further develop potential models to estimate current and future agriculture and forest soil/biomass carbon levels

3.2 IDAHO DEMOGRAPHICS

For Idaho to develop any climate change programs and policies, which may eventually be used help reduce greenhouse gas emissions, and/or provide offsets through agricultural and forest practices, a baseline amount of existing agricultural and forest related emissions and current sequestration levels must be established. These amounts will provide a “platform” in which potential amounts carbon sequestration or greenhouse gas emission reductions and offsets may be compared to determine its state-wide potential. Understanding Idaho’s natural resource characteristics and current land use and management is the first step.

3.2.1 Land Ownership

Approximately 63% of Idaho’s land are public land, managed by federal agencies. Bureau of Land Management (BLM) manages about 22%, the US Forest Service (FS) manages about 38%, and private lands consist about 38% of Idaho’s lands. In the context of carbon sequestration on private lands, this would only constitute about 1/3 of the state, whereas, a large quantity of carbon sequestration is likely occurring on public and state lands. The potential for additional practices and improvements on these non-private lands may be great enough for the state to consider policies

Table 2. Land Type

1997 Estimates for Idaho

Category	Acres	Percent
Federal Land (non forest)	33,563,300	62.7%
Rangeland	6,500,500	12.2%
Cultivated Cropland (62% irrigated)	4,541,300	8.5%
Forestland (federal)	3,947,800	7.4%
Pastureland	1,314,800	2.5%
Non-Cultivated Cropland	976,000	1.8%
CRP Land	784,800	1.5%
Other Rural Lands	552,500	1.0%
Large (Census) Water	471,700	0.9%
Urban Lands	425,200	0.8%
Rural Transportation	329,700	0.6%
Small Water	79,900	0.1%
Total Surface Area	53,487,500	100.0%

Source Data: USDA Natural Resources Conservation Service, Idaho 1997 NRI (Revised 12/2000)

<http://www.id.nrcs.usda.gov/nri/index.html>

and programs to enhance sequestration activities beyond just its private lands.

Table 3 provides another categorization on lands in Idaho, broadening into some of the land use data. Where Table 2 and Figure 3 show ownership, Table 3. provides a better description of the diversity in the state. The NRI data and data obtained from the state's GIS data may not coincide exactly due to the differences in the methods of their production. However, the differences in the totals do not discourage the state-wide analysis and estimates on carbon sequestration potential.

3.2.2 Land Use

According to 1997 NRI data, Idaho had about 19.4 million acres of nonfederal rural land in 1997. 35% of it is rangeland, 30% cropland, 21% forestland, and 7% pastureland. Harvested cropland acres are about 4.5 million acres (see also 2002 Ag statistics). The number of acres enrolled in the Conservation Reserve Program, over 790,000 acres as of 2003 (<http://www.fsa.usda.gov>).

Table 3. Land Owner/Manager		
Owner/Manager	Acres	Percent
B.L.M.	11996648	22.3%
Bureau of Indian Affairs	687272	1.3%
Department of Energy	571744	1.1%
Forest Service	20743087	38.5%
Military Reservations	133301	0.2%
National Parks & Monuments	97509	0.2%
Open water	513682	1.0%
Private	16180017	30.0%
State of Idaho	2844964	5.3%
U.S. Fish & Wildlife Service	140909	0.3%
Total	53909133	
Source: idown.shp GIS shape file found at http://www.idwr.state.id.us/ftp/gisdata/shapefiles/statewid/ Acres may not be exactly the same as the NRI data		

Nearly 2.8 million cropland acres are considered "prime farmland." Prime farmland has the best combination of physical and chemical properties for producing food, feed, forage, fiber and oilseed crops and are also available for these uses.

About sixty-two (62) percent of Idaho's total cropland is irrigated, about 3.5 million acres. Idaho ranks 5th among states for the most federal land. Nonfederal land is about 19 million acres. Of these acres, nearly 4 percent, or 750,00 acres, are considered developed. Federal land totals about 33.5 million acres (63% of total land).

Private grazing lands total 9.4 million acres and include pastureland, rangeland, and grazed forestland. Grazing lands make up over 50% of Idaho's nonfederal rural land. Today, growth and prosperity are leading to expansion of small and mid-sized cities onto agricultural land. From 1982 to 1997, developed land has increased by 204,700 acres.

Land use is dynamic and therefore changes in use occur between each inventory period. The average annual rate of conversion to developed land in Idaho was 16,560 acres for the period 1992-1997. In the period 1982-1992 the average rate was 11,250 acres. This is an increase of 47 percent. The rate of increase was highest on rangeland, followed by pastureland, cropland, and then forestland. In terms of conversion rates, Idaho ranked 36th in the nation in 1997. Development, or urban built-up, increased by 91,900 acres in Idaho from 1992 to 1997. Sixty three (63) percent of this increase occurred in the following Idaho counties: Ada, Canyon, Kootenai, Twin Falls, Elmore, Bannock, and Bonneville.

3.2.3 Vegetative Cover

As shown in Table 4., the vegetation cover types on various lands owned or types of land have been estimated through geographical analysis, with multiple data and a simple query. The values within each category incorporates various land coverage, such as roads and other physical aspects, but given

consistency in is development, the data can be used to compare cover types by ownership. Forested land, sagebrush, and croplands consist of the majority of the cover type. Within the forested category, there actually over 30 types of cover, which has been summarized within the table to simplify it. Thus forested land actually consists of approximately 40% of the total cover, where cropland and pasture is about 17%, sagebrush communities near 27%. The remaining 84% consists of various grasses, shrubs, riparian/wetland species, and non-vegetative cover, such as urban lands.

When looking just at the cover types just on private land, about 50% of private land is in cropland and pasture, 21% in various forest types, and 17% in various sagebrush types. State lands consist of 40% of various forested types, 39% in sagebrush type communities, and nearly 4% in cropland and pasture. Of the entire cropland and pasture, 92% is on private lands, 4% on BLM, 1% on state lands and 1% on Bureau of Indian Affairs. Forested lands are found to be 77% in Forest Service land, 16% on private lands, 5% on State lands, and 2% on BLM.

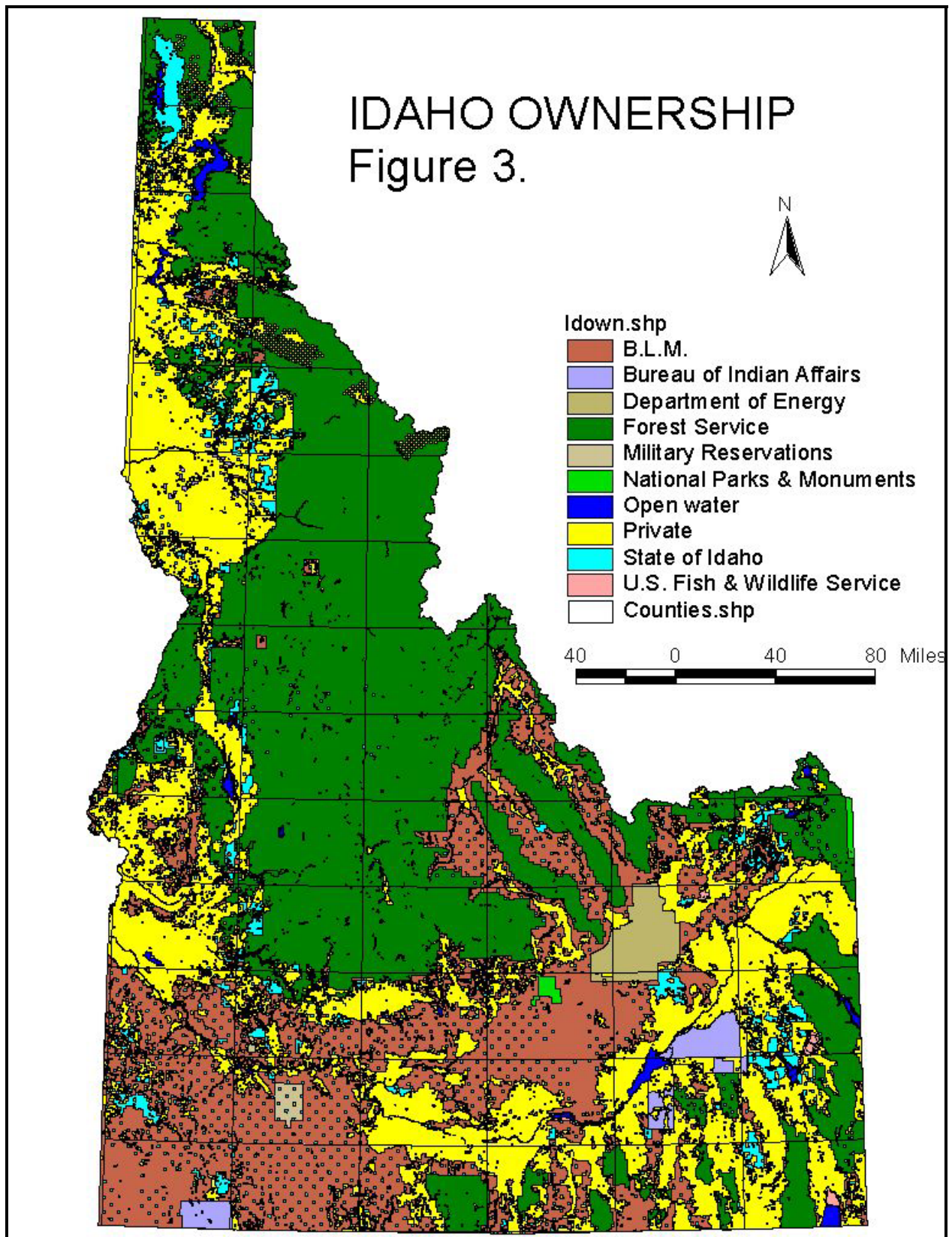
The percent land owner/type of cover type is shown in Appendix 1, Table 1. The bolded numbers are those greater than 10% for the sake of comparison. Where , for example 92% of Agricultural lands primarily exist on private lands and 78% perennial bunchgrass seedings are found on BLM. In contrast, Table 2 in Appendix 1 shows the percent of cover type within each land owner/type category, where private lands consist mostly of agricultural crop, pasture, Montane forests, and shrub steppe and grassland communities for example.

Once there is a basic understanding of Idaho's land resources, the analysis of potential carbon sequestration and reductions of greenhouse gases related to agricultural and forestry activities may be initiated. There are some additional steps and information that is needed, however, to effectively describe the potential for the implementation of activities. Land management, cropping histories, livestock population data, and other physical and social aspects need to be evaluated in relationship to the effectiveness of various activities on carbon sequestration and greenhouse gas reductions.

3.2.4 Land Management

Like many states in the west, Idaho has a very significant amount of federally owned land. Private landowners and local state and tribal governments have the responsibility for conservation on 36 percent of the state. Nonfederal land is predominantly rural and supports a variety of land-based industries. Proper management of these lands is critical to the overall health of the State's natural resources.

Farmers and ranchers focused primarily on slowing erosion on our most susceptible soils in the 1980's and early 1990's. Those efforts have paid off by controlling erosion that not only sustains the long-term productivity of the land, but also affects the amount of soil, pesticides, fertilizer, and other substances that move into the Nation's waters. Sheet and rill erosion on cropland decreased about 35% between 1982 and 1997. Wind erosion on cropland decreased about 18%. NRCS-NRI reports indicate there was a reduction in the total sheet/rill and wind erosion on Idaho's agricultural lands, from an estimated 50.4 million tons per year in 1982 to 36.2 million tons per year in 1997. This is a decrease of 14.2 tons per year.



Rangeland management, including riparian areas, have been heavily used by livestock producers over the last 150 years or more, with varying degrees of long-lasting impacts. Rangeland areas have been severely altered because of weed infestations or complete changes in vegetative communities (perennial grasses to annuals). The livestock industry has evolved from producing millions of sheep to cattle, the majority of the livestock now, mostly due to market demands and culture. A substantial amount of work has been done to improve grazing management, but much more is needed to improve the health of a majority of the existing rangelands. In some areas of the state, grazing practices have actually altered habitats, actually increasing water surface areas with stock ponds and increasing available wildlife food sources within pastures and riparian areas, and such.

Table 4. Cover Type by Land Owner/Type

Cover Type Group	B.L.M.	Bureau of Indian Affairs	Department of Energy	Forest Service	Military Reservations	National Parks & Monuments	Open water	Private	State of Idaho	U.S. Fish & Wildlife Service	Grand Total
Agricultural crop and pastureland	391173	114268	6015	38749	2027	309	35720	8197413	94519	11000	8891193
Alpine	620			207293			601	316			208829
Annual grasslands	1090662		3874	1634	40991		2612	456316	99460	1373	1696922
Foothills and Plains Woodlands	455921		10279	123983		17110	1980	117438	56823	947	784480
Montane Forests	273359	31144		10166286	15032	1120	12522	2732717	769067	311	14001558
Montane Forest-Steppe Transitions	486662	43479		3132790	3795		3822	830258	240406	384	4741595
Montane Shrubfields	241253	1177		964630			6038	335678	120410		1669185
Perennial bunchgrass seedings	955014		7613	5324	53346	3799	406	128742	58888	6797	1219930
Recent timber harvest areas	1428			310562	770	5	188	152804	54816		520574
Riparian and Wetland Types	18222	16688		41045	0	975	412830	177588	14083	46114	727545
Shrub Steppe and Grasslands	8301401	344224	538867	859893	16528	37940	24759	2942384	988546	4938	14059480
Subalpine Forests	30540			2717139		35872	3095	66650	19349		2872645
Subalpine Parklands	8254			1794495			4239	23169	73815		1903973
Urban and Industrial	2341			408	2771		3287	155076	315		164198
Grand Total	12256850	550980	566648	20364231	135260	97129	512098	16316548	2590498	71865	53462106

Source of data: idown.shp and veg.shp statewide gis coverage. Intersection of data was completed in ArcView 2.0 to create table. See <http://www.idwr.state.id.us/ftp/gisdata/shapefiles/statewid/> for gis shape files and metadata information

Private, tribal, and state forest lands are operated similarly to farm and ranch owned lands, but with different natural resources. Forestry activities are governed by the Forest Practices Act and its associated practices, varying practices activities occur within the state's forests lands, ranging from logging to recreation to recreation, with vast natural resources contained within. Much of the activities that occur on private lands are unknown, where state and federal regulations tend to focus on state and public lands, requiring a substantial amount of inventories.

Among the urban areas of the state, there exist controversial issues among citizens within the rural-urban interface. Rural land uses are becoming surrounded by urban land uses, and conflicts arise from simply because of conflicting uses and their off-site impacts. Within these areas, smaller ranchettes exist in

greater proportion, combining rural lifestyles with urban benefits, such as shopping and recreational activities close by.

3.2.5 Cropping History

Agricultural crops have been grown in Idaho since before 1900. Many crop varieties are found throughout the state, but most varieties exist under irrigation, primarily in southwestern and south central Idaho, within the Snake River Plain. The most common crops, those covering the majority of the cropland in the state, are listed in Table 6. Overall, there has been a reduction in crops planted since 1980, though some varieties have increased, such as corn for grain and silage, alfalfa hay, oats, potatoes, and sugarbeets. The year 2000 amount of winter wheat varieties is virtually ½ of that planted in 1980. Some increase in corn and alfalfa hay plantings have increased due to an increase in the size of local dairies and feedlots, causing county acreages to increase substantially, such as those in the Magic Valley.

Table 5. 2000 - 2001 Idaho Agriculture Statistics. See <http://www.nass.usda.gov>

Field Crop Summary: Harvested Acres, Yield, Production and Value, Idaho,2000-01										
Crop	2000					2001				
	Harvested	Yield Per Acre	Unit	Production		Harvested	Yield Per Acre	Unit	Production	
				Total	Value				Total	Value
	<i>Acres</i>			<i>1,000</i>	<i>1,000 Dollars</i>	<i>Acres</i>			<i>1,000</i>	<i>1,000 Dollars</i>
Barley	730,000	76.0	Bu.	55,480	143,693	670,000	75.0	Bu.	50,250	138,188
Corn for Grain	57,000	160.0	Bu.	9,120	23,986	45,000	150.0	Bu.	6,750	17,213
Corn for Silage	135,000	25.0	Ton	3,375	NA	125,000	25.0	Ton	3,125	NA
Dry Beans, Commercial	88,000	19.5	Cwt	1,716	29,687	73,000	19.5	Cwt	1,424	27,056
Hay, Alfalfa	1,130,000	4.2	Ton	4,746	450,870	1,120,000	3.9	Ton	4,368	524,160
Hay, All	1,390,000	3.8	Ton	5,292	491,547	1,420,000	3.5	Ton	4,938	573,465
Hops	3,321	1,484.0	Lb.	4,930	8,775	3,469	1,329.0	Lb.	4,609	7,421
Mint										
Peppermint	15,000	95.0	Lb.	1,425	14,678	14,000	92.0	Lb.	1,288	13,524
Spearmint	1,000	130.0	Lb.	130	1,040	900	105.0	Lb.	95	798
Oats	20,000	70.0	Bu.	1,400	1,750	20,000	68.0	Bu.	1,360	2,108
Potatoes, All	413,000	369.0	Cwt	152,320	609,280	368,000	348.0	Cwt	127,980	691,092
10 S.W. Counties	28,000	490.0	Cwt	13,720	NA	26,000	450.0	Cwt	11,700	NA
Other Counties	385,000	360.0	Cwt	138,600	NA	342,000	340.0	Cwt	116,280	NA
Sugarbeets	191,000	29.3	Ton	5,596	212,088	179,000	25.9	Ton	4,636	NA
Wheat, All	1,300,000	83.4	Bu.	108,450	281,124	1,200,000	71.0	Bu.	85,150	279,144
Wheat, Spring	570,000	75.0	Bu.	42,750	118,845	490,000	68.0	Bu.	33,320	113,288
Wheat, Winter	730,000	90.0	Bu.	65,700	162,279	710,000	73.0	Bu.	51,830	165,856
NA-Not available										

NA-Not available

Crop varieties often require different management, especially specialty crops, such as seed crops. Small seeded crops, such as sugarbeets, are not easily cultivated with high levels of residue left over from the previous crop. Thus, tillage operations on many crops that require cultivation are fairly intensive, eliminating residues to ensure cultivation techniques are successful, and do not disturb the seeds and small plants. Surface irrigation has also hindered farmers in regards to tillage, where reconditioning sloped field surfaces and corrugates for uniform water delivery to the crops. Some progress has been made though fewer tillage passes under irrigation, primarily under sprinkler systems, as under dry cropland conditions. In Northern Idaho, direct seed, often more commonly known as no-till, is becoming widely adopted on the few of the crops grown in that region of the state.

Understanding the management that typically coincides with crop variety will help estimate the potential for carbon sequestration practices, primarily related to tillage. The potential for the conversion of cropland to a long-term forest stands that store carbon may also be based on current cropland profits. If crop markets are expected to continue or increase profits in the future, the conversion to a long-term forest stand may not be as economically viable within a carbon market. Conversion from one crop to another for the sake of carbon sequestration may not in itself be viable either, while carbon flux among vegetation types may not differ substantially. If the conversion of an annual crop requiring tillage to a perennial crop that does not require any tillage for maintenance happens, the carbon flux will most likely be reduced because of much less tillage, which tillage causes excess carbon dioxide losses on croplands.

3.2.6 Livestock

Estimating the potential methane and other greenhouse gases from livestock may be helpful when establishing state-wide policies on carbon sequestration activities. Where carbon is main focus of this report and current analysis, methane losses, as well as nitrous oxides and other gases may be as important Idaho to address in order to establish a state-wide net reduction in greenhouse gases. Sequestration activities may indeed offset a large quantity of other sources gases, but where Idaho's fossil fuel related emissions are low, agricultural related greenhouse gases may be considered as high a priority for reduction to outside interests and the federal government under potential future greenhouse gas regulations. The state of Idaho should assess all sources and establish documentation on those sources, prior to establishing priority actions, which may be needed to justify those chosen actions to outside interests in order for the agricultural and forest owners in Idaho to benefit through markets and trading activities.

Table 6. 2002 Idaho Agriculture Statistics. See <http://www.nass.usda.gov>

Cattle and Calves: Inventory, by Classes and Weight, Idaho, January 1, 1993-02											
Year	All Cattle and Calves	All Cows & Heifers That Have Calved			Heifers 500 Pounds and Over				Steers 500 Lbs. & Over	Bulls 500 Lbs. & Over	Calves Under 500 Lbs.
		Total	Beef Cows	Milk Cows	Total	Beef Cow Replace- ments	Milk Cow Replace- ments	Other			
1,000 Head											
1993	1,680	690	505	185	375	95	100	180	360	40	215
1994	1,740	700	507	193	405	100	105	200	365	40	230
1995	1,820	730	510	220	420	100	115	205	390	40	240
1996	1,820	760	515	245	410	95	110	205	385	40	225
1997	1,820	780	512	268	415	95	120	200	365	40	220
1998	1,860	800	520	280	440	95	135	210	360	40	220
1999	1,900	800	498	302	440	95	135	210	365	40	255
2000	1,950	820	488	332	465	100	160	205	365	40	260
2001	1,960	840	486	354	460	100	165	195	380	40	240
2002	1,990	870	493	377	460	85	175	200	360	40	260

From 1964 to 1997, the number of hogs, pigs, and sheep have declined, but calves, beef cattle, and milk cattle have increased. The 2002 Idaho Agriculture Statistics bulletin shows 2001 populations of dairy cows to be about 377,000 head. The number of livestock farms, however, have dramatically declined, suggesting a much larger number of livestock per farm, which is the case for beef and dairy operations. For instance, based on the table below, in 1964, the average number of beef cattle per farm was about 41 head. In 1997, the average number of beef cattle per farm was 66, an increase of about 61% number of cattle per farm. This increase in farm populations can have dramatic effects on production efficiency,

environmental impacts, and social acceptance. New odor and nutrient management regulations have resulted because of social pressure and natural resource concerns. Greenhouse gas emissions from large feedlot and dairy operations, which may have liquid waste treatment ponds or those with composting facilities are subject, are likely to emit larger amounts than what possibly occurred under smaller operations with less manure waste and ruminant emissions per farm.